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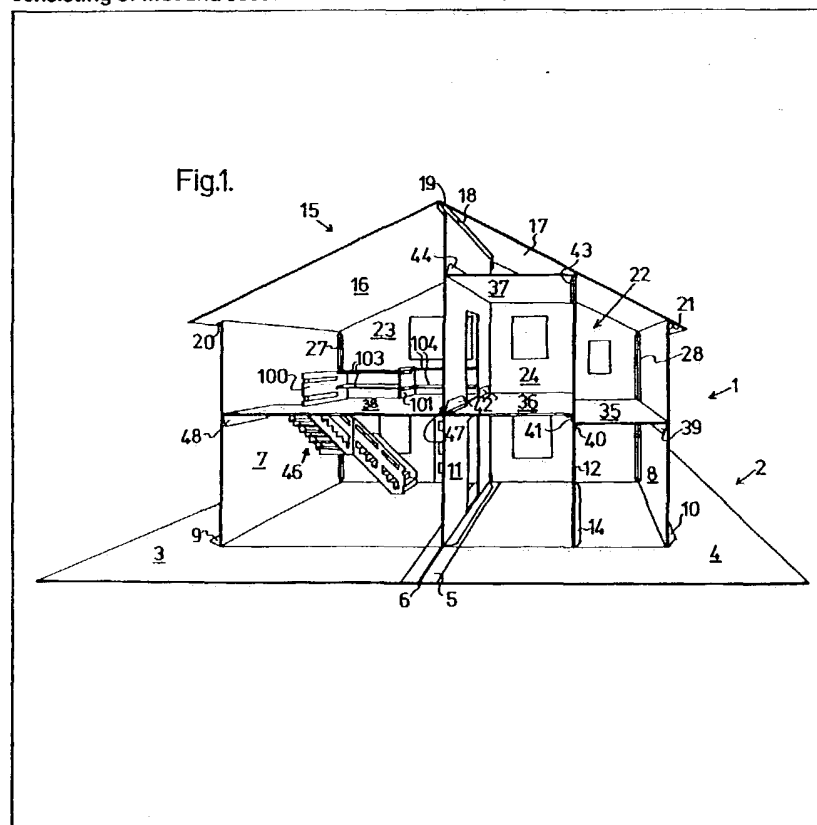
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 GB 495153
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(54) A collapsible and self-erecting model building

(57) A collapsible and self-erecting model building 1 comprises a base 2 consisting of first and second base

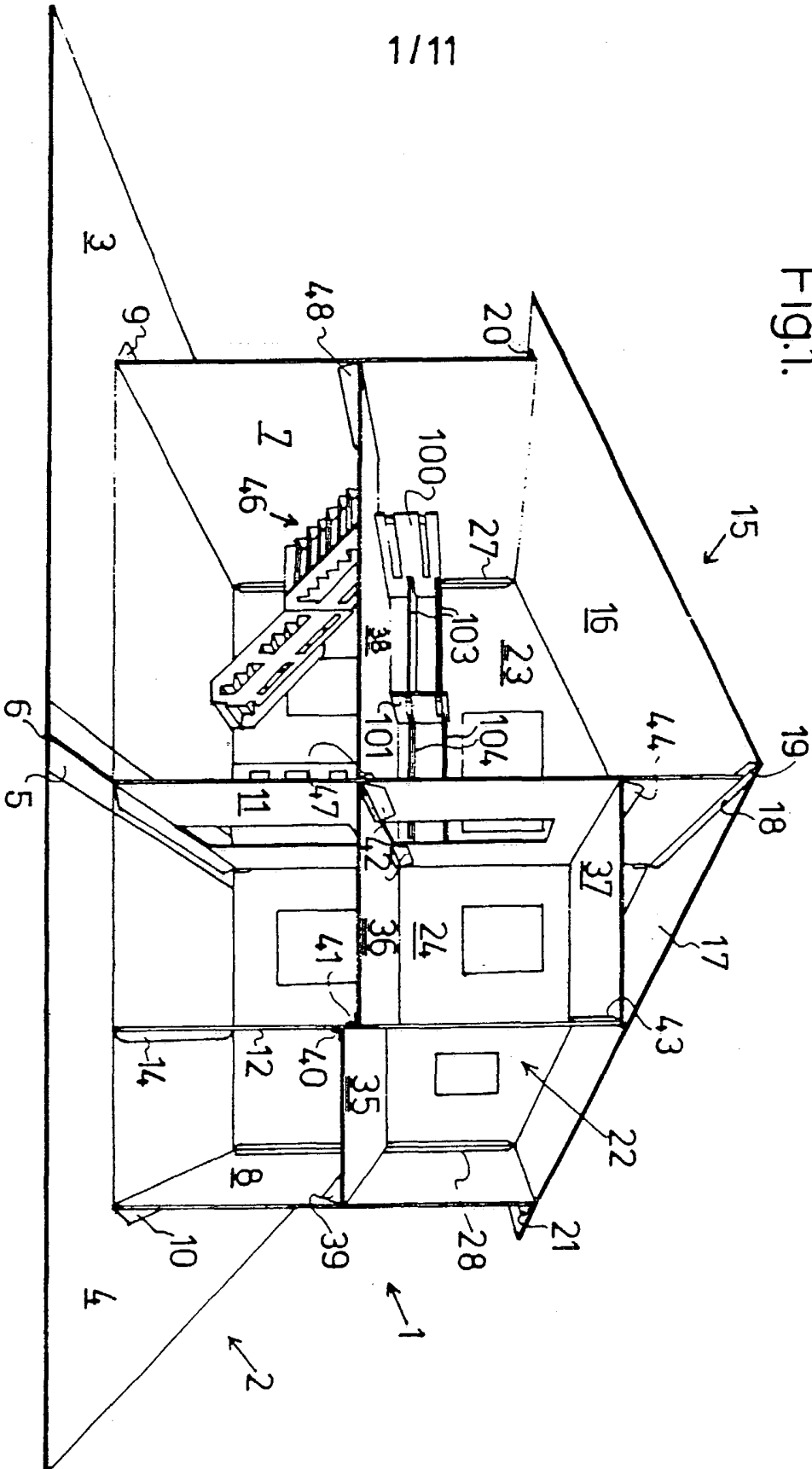
panels 3, 4 hinged together about a first hinging axis 6, a pair of spaced apart side wall panels 7, 8 and at least one internal wall panel 11, 12, each wall panel being hingedly connected to the base 2 about a hinging axis (13), 14 parallel to the first hinging axis 6, and floor panels 35 to 38, hingedly connected between each adjacent pair of wall panels. The building 1 is automatically collapsed by folding the base panels 3, 4 towards each other into a folding plane thereby causing the wall panels 7, 8, 12 to move towards, whilst remaining parallel to, the folding plane, and each floor panel to move towards, whilst remaining parallel to, that base panel 3, 4 which is on the same side of the folding plane as the floor panel in question. The building 1 is re-erected by folding the base panels 3, 4 away from the folding plane.

The model building is provided with a back wall (not shown), a front wall 22, a roof 15, and a staircase 46.

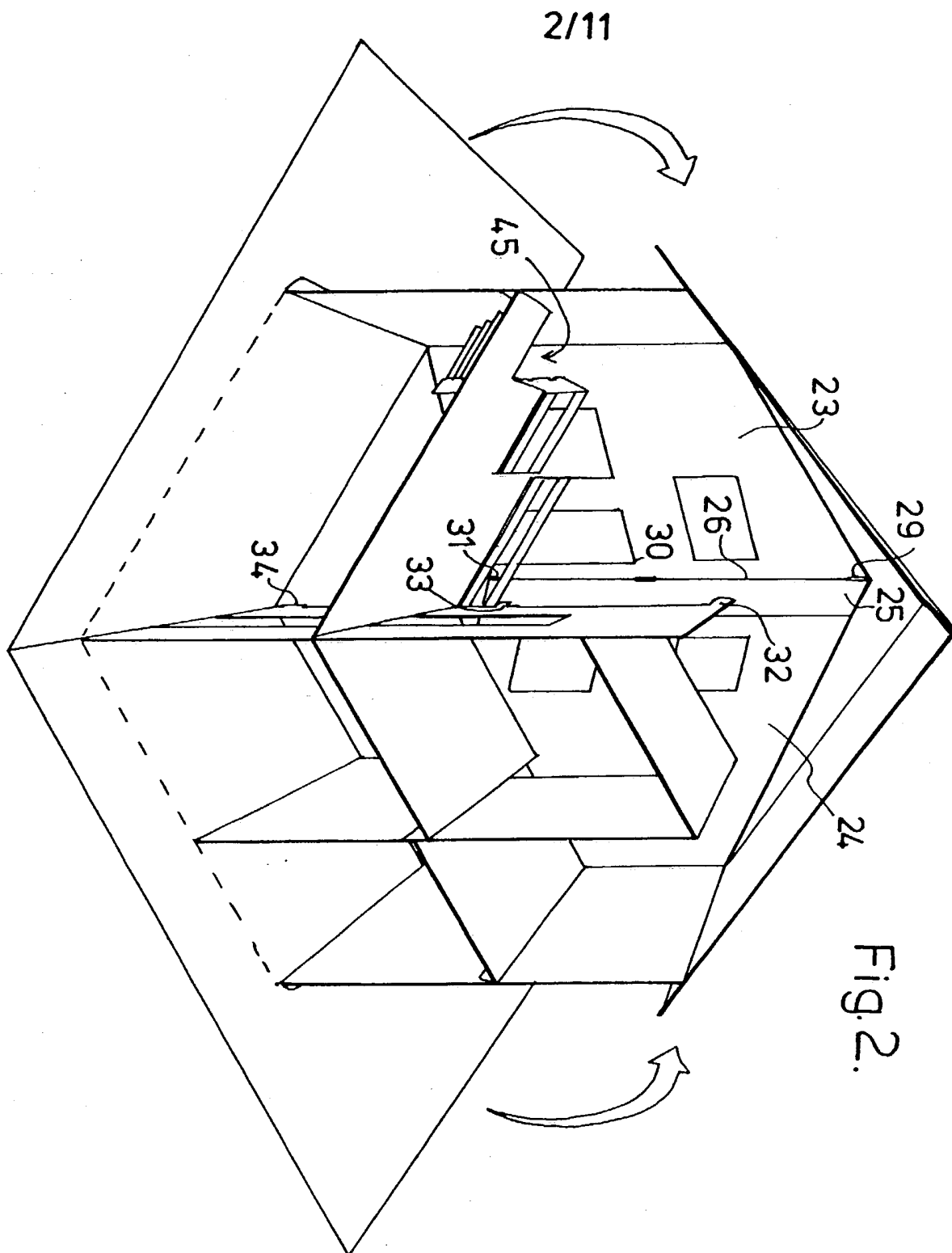


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Fig. 1.



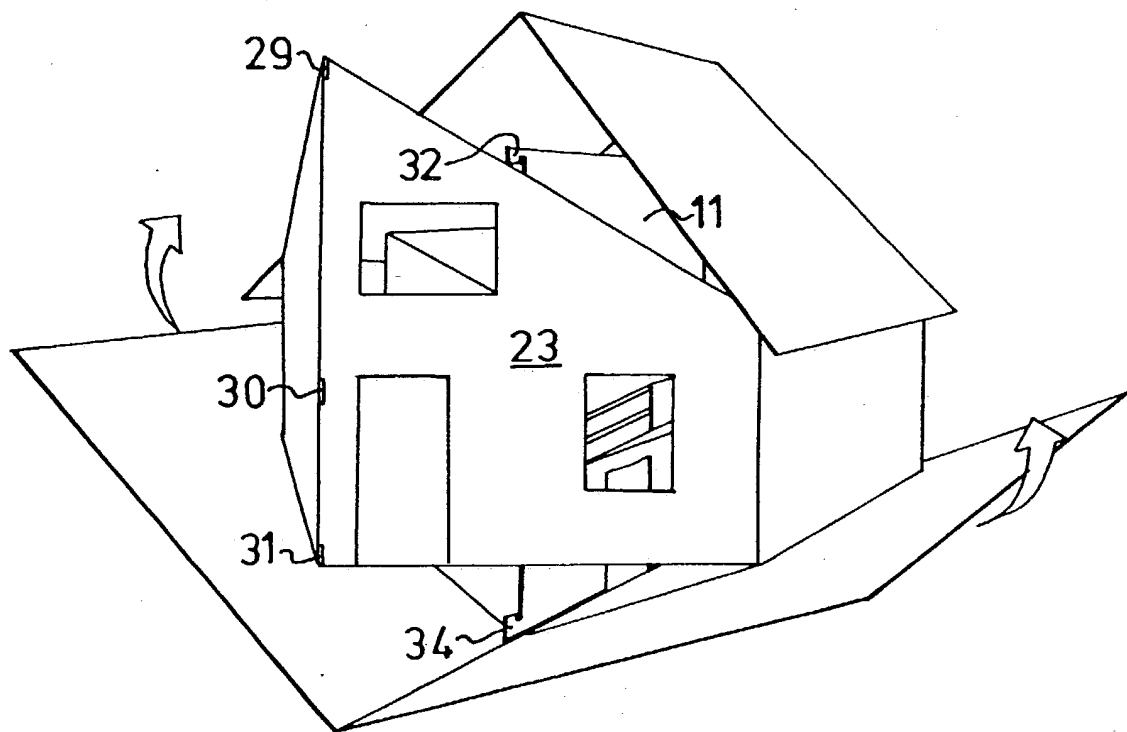
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Fig. 3.



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Fig. 4a.

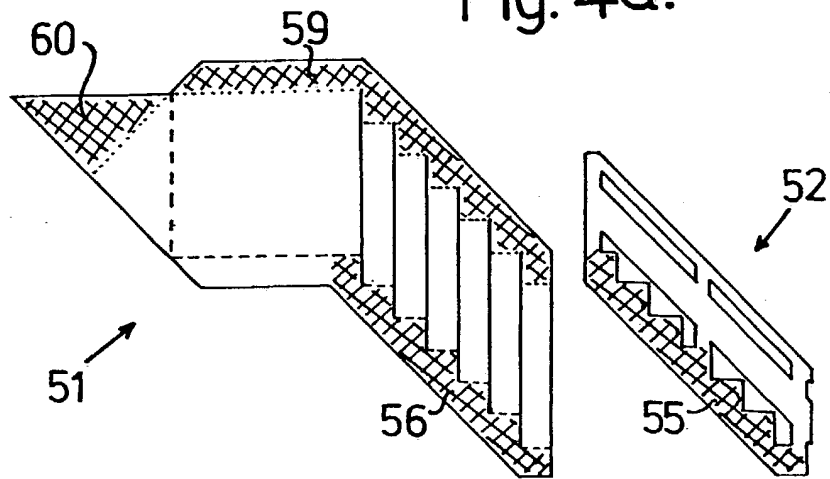


Fig. 4b.

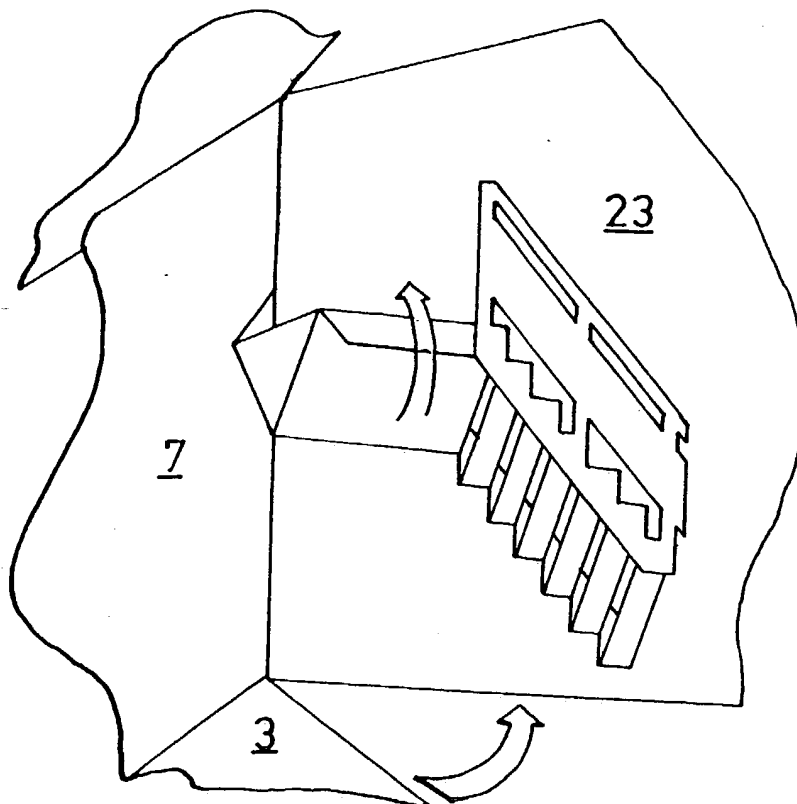


Fig. 5a.

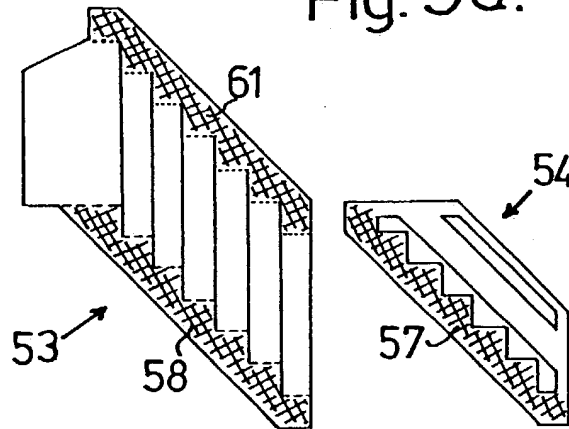


Fig. 5b.

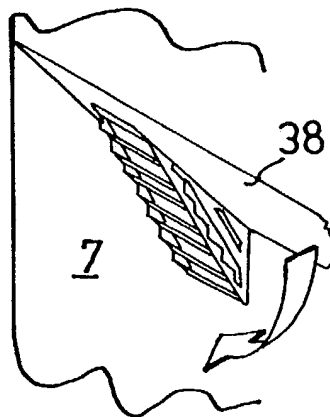
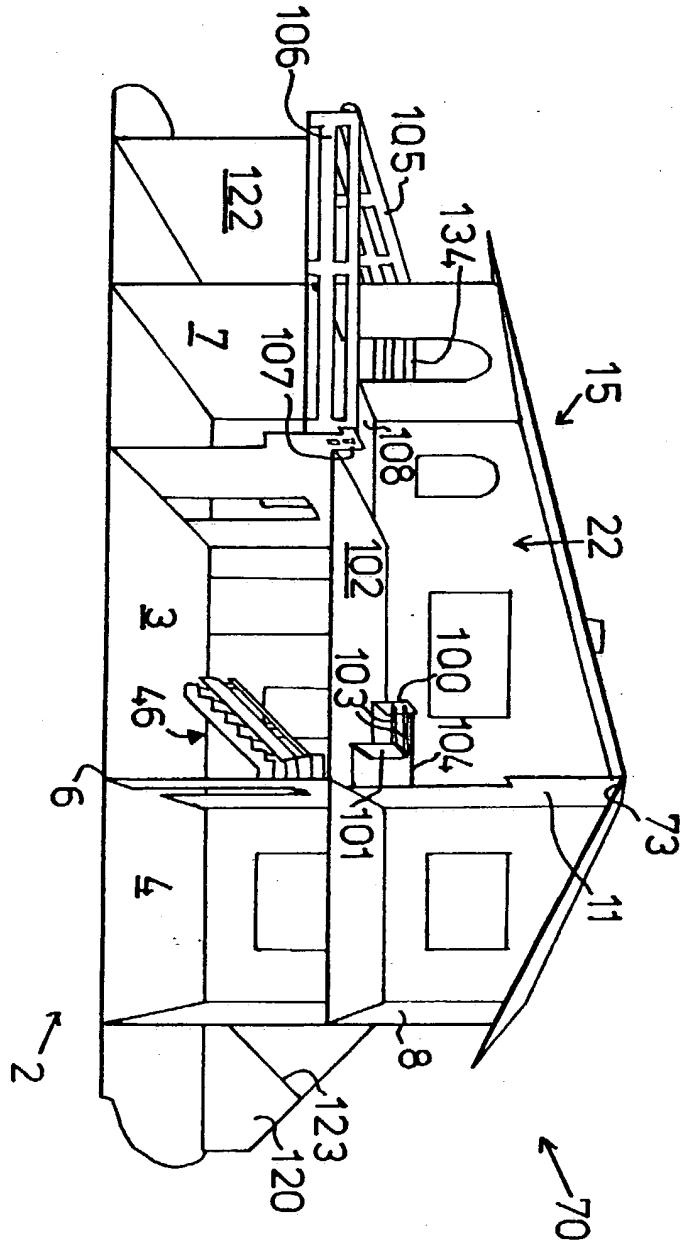


Fig. 6.



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Fig. 7.

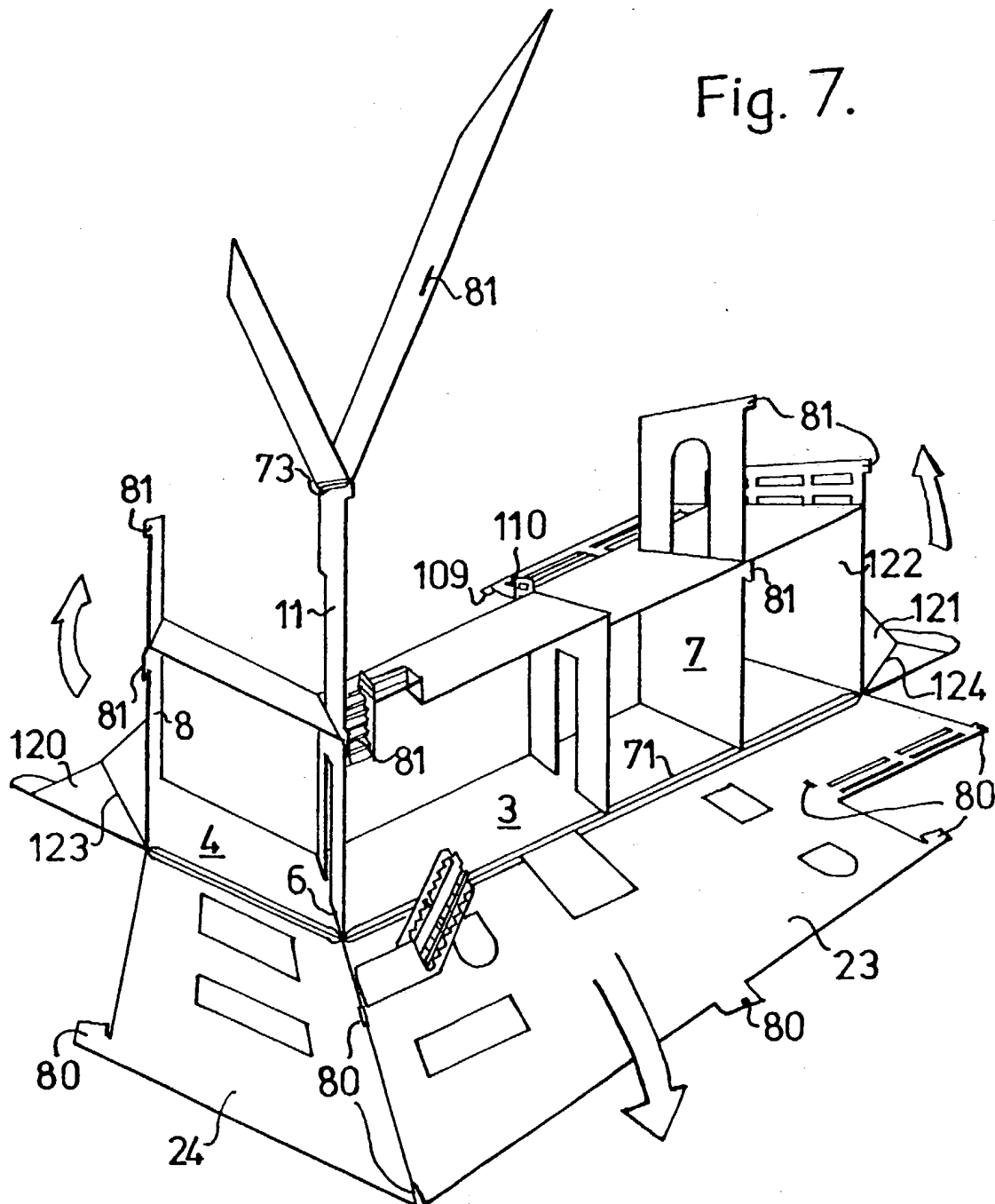


Fig. 8a.

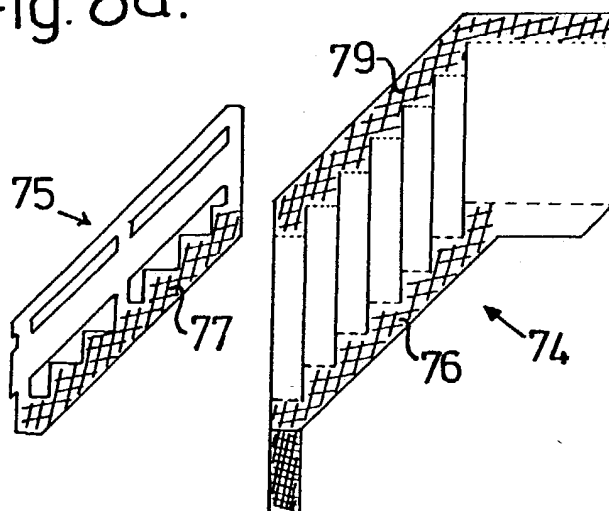


Fig. 8b.

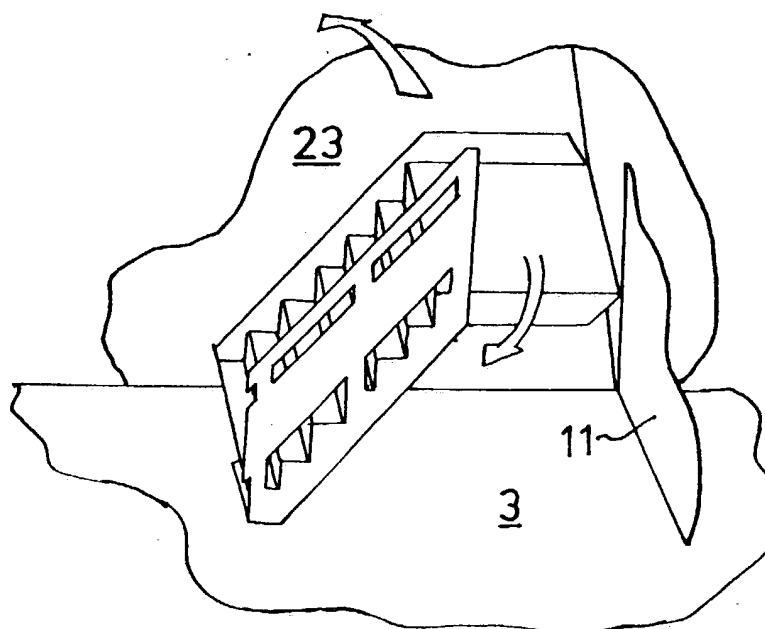
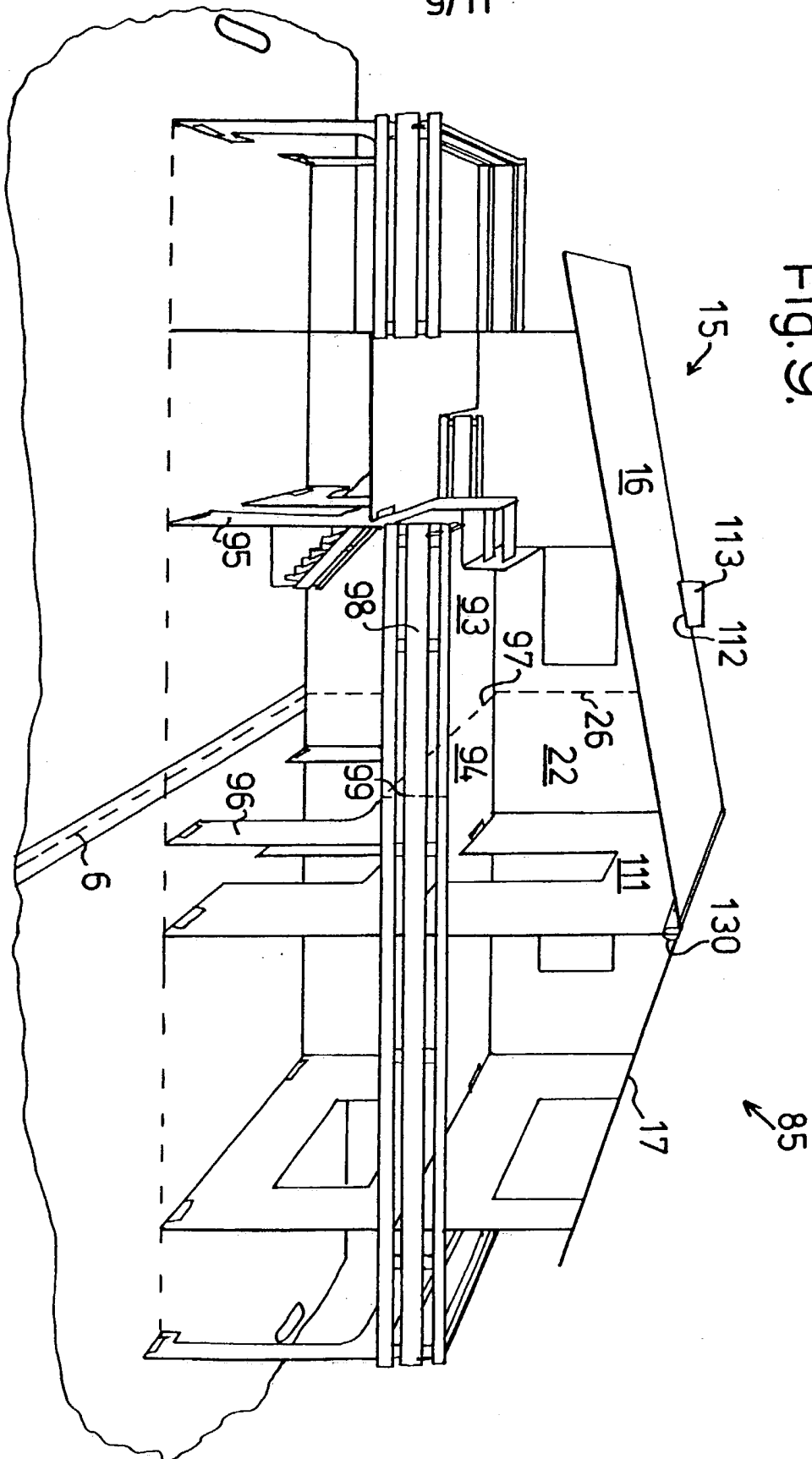


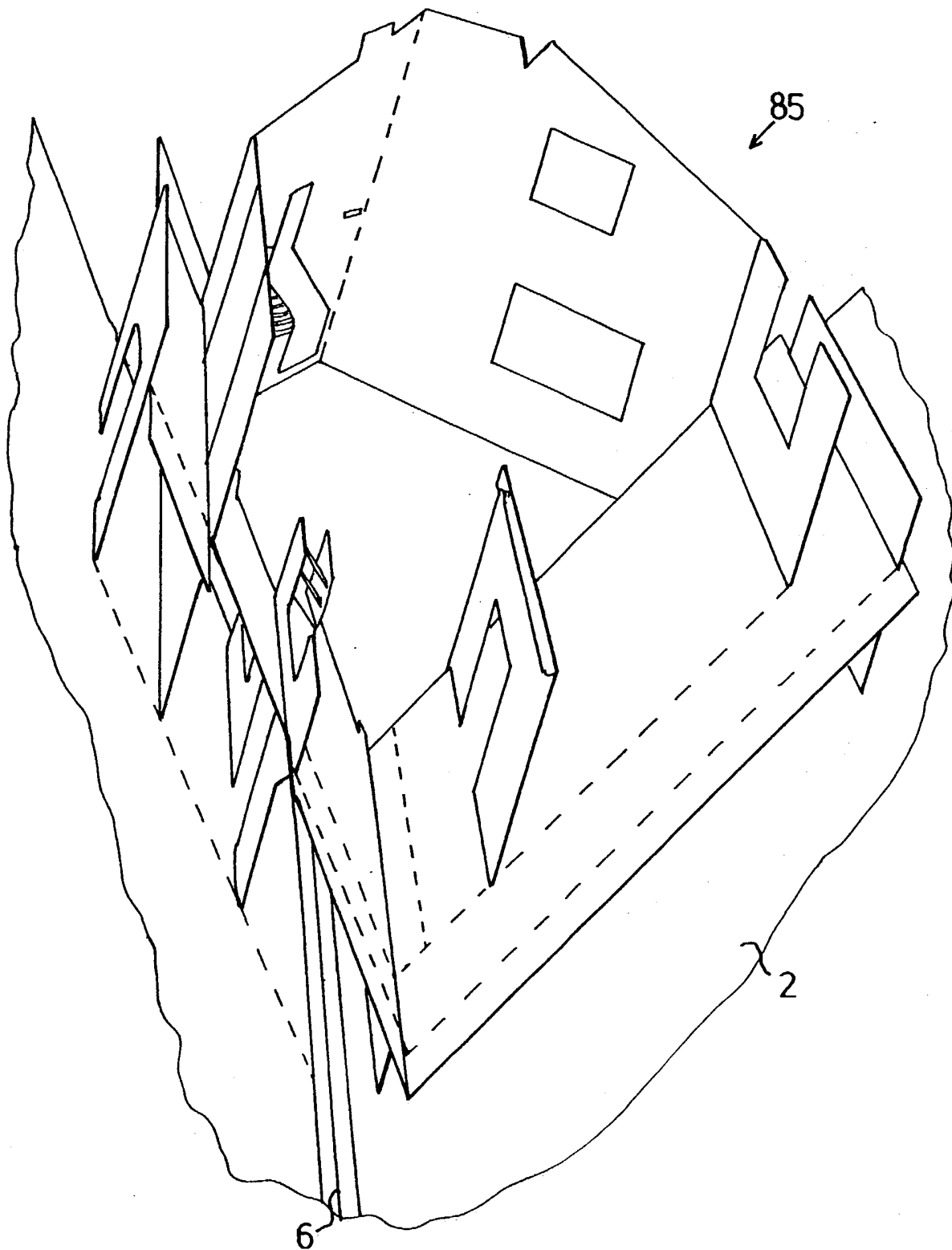
Fig. 9.



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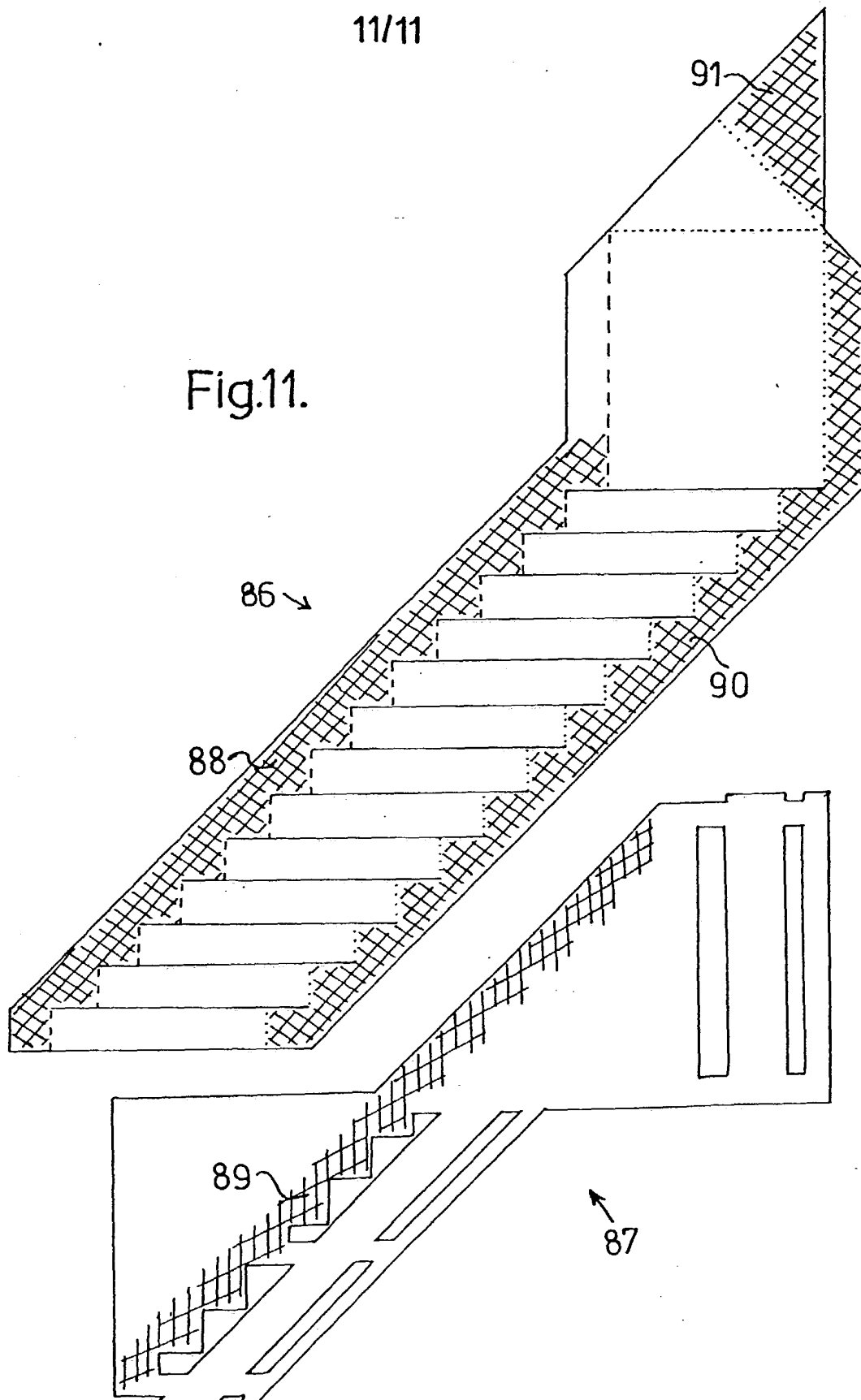
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Fig.10.



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Fig.11.



SPECIFICATION

A collapsible and self-erecting model building structure

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This invention relates to a collapsible and self-erecting model building structure, e.g. a dolls house or toy fort, which may more commonly be referred to as a "pop-up" model building structure.

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According to the invention a collapsible and self-erecting model building structure comprises a base consisting of first and second base panels which are hingedly connected together about a first hinging axis and which occupy an open position in which the base panels lie in a common plane on opposite sides of the first hinging axis, the first and second base panels being foldable towards each other about said first hinging axis into a closed position in which the base panels are disposed above, and at least substantially in a folding plane perpendicular to, said common plane, at least three spaced apart, parallel upstanding panels hingedly connected to the base about hinging axes parallel to the said first hinging axis, two of said upstanding panels, disposed on opposite sides of said folding plane, constituting side walls of the model building structure, at least one first rigid linking means spaced above, and disposed on the same side of said folding plane as, in parallel relationship to, said first base panel, at least one second rigid linking means spaced above, and disposed on the same side of said folding plane as, in parallel relationship to, said second base panel, the rigid linking means at least one of which is a floor panel, being arranged so that each pair of adjacent upstanding panels is connected by at least one link, each link being hingedly connected at its opposite ends to adjacent upstanding panels about hinging axes parallel to said first hinging axis and consisting of either a pair of rigid linking means hingedly connected together about a second hinging axis which is parallel to said first hinging axis and is contained in said folding plane or a single rigid linking means, whereby on folding the base panels from their open position to their closed position, the upstanding panels are moved towards, whilst remaining substantially parallel to, the folding plane, the first rigid linking means are moved towards, whilst remaining substantially parallel to, the first base panel and the second rigid linking means are moved towards, whilst remaining substantially parallel to, the second base panel, thereby causing the model building structure to collapse, and whereby on folding the base panels from their open position to their closed position, the upstanding panels, first rigid linking means and second rigid linking means are moved away from, whilst remaining substantially parallel to, the said folding plane, the first base panel and the second base panel, respectively, thereby causing the model building structure to be erected.

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Conveniently each of said first and second rigid linking means consists of a floor panel.

Suitably each of the said panels is made of a semi-rigid and substantially non-extensible material, e.g. hardboard.

65

A panel may be hinged to another panel by means of a tape connection or by means of a metal or plastics hinge.

Typically the model building structure is also

70 provided with an upstanding front wall, which may consist of two front panels which are hingedly connected together about a third hinging axis contained in the said folding plane and perpendicular to the first and second folding axes. In this case the 75 front wall, along side edges on opposite sides of and parallel to said third hinging axis, may be hingedly connected to each of the upstanding panels constituting said side walls about hinging axes parallel to said third hinging axis, the front wall being adapted 80 to fold about said third folding axis as the latter moves within the folding plane during folding of the said first and second base panels between their open and closed positions. Alternatively the front wall may be hingedly connected to the base about a 85 fourth hinging axis perpendicular to the said folding plane; the said front wall being foldable about said fourth hinging axis into the said common plane, so that said third hinging axis aligned or coaxial with said first folding axis, to enable the model building 90 to be collapsed by folding the base panels between their open and closed positions. In either case the front wall may be provided with locking means, cooperable with further locking means on one or more of the upstanding panels and/or the base, to 95 enable the front wall to be locked in its upstanding position.

Advantageously one of the floor panels is provided with a staircase opening, a staircase extending from the staircase opening to the base. The staircase 100 may consist of a single flight of stairs hingedly connected to the front wall or one of the said upstanding panels. Alternatively, the staircase may consist of a first and a second flight of stairs, one of the flight of stairs being hingedly connected to the 105 front wall and the other flight of stairs being hingedly connected to one of the said upstanding panels.

The building structure may be provided with a roof spaced above said floor panels. The roof may be detachably connected to one or more of the said upstanding panels. Alternatively the roof may consist of one or more of said upstanding panels.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

115 *Figure 1* is a perspective view from the rear of one embodiment of a model building structure, according to the invention, in a fully erected state,

Figures 2 and 3 are perspective views from the rear and front, respectively, of the building structure shown in *Figure 1* in a position intermediate its fully erected and fully collapsed states,

Figures 4a and 5a are plans of blanks for forming lower and upper flights, respectively, of a staircase of the model building structure shown in *Figure 1*,

Figures 4b and 5b are schematic views showing how the blanks shown in *Figures 4a and 5a*, respectively, are foldably connected to parts of the model building structure,

130 *Figure 6* is a perspective view from the rear of a

second embodiment of a model building structure, according to the invention, in a fully erected state,

Figure 7 is a perspective view from the front of the model building structure shown in Figure 6 in a position intermediate its fully erected and fully collapsed states,

Figure 8a is a plan of blanks for forming the lower flight of a staircase of the model building structure shown in Figure 6,

Figure 8b is a schematic view showing how the blank shown in Figure 8a is foldably connected to parts of the building structure shown in Figure 6,

Figure 9 is a perspective view from the rear of a third embodiment of a building structure according to the invention in a fully erected state,

Figure 10 is a perspective view from the rear of the model building structure shown in Figure 9 in a position intermediate its fully erected and fully collapsed states, and

Figure 11 is a plan of blanks for forming the staircase for the model building structure shown in Figure 9.

Figure 1 shows a collapsible and self-erecting (or "pop-up") doll's house, generally designated by the reference numeral 1, in a fully erected state. The doll's house comprises a rectangular base, generally designated 2, consisting of two rectangular base panels 3 and 4 connected together by hinging means 5, e.g. a tape, so as to be foldable relative to each other about a first folding or hinging axis 6. A pair of upstanding, spaced apart rectangular panels 7 and 8, constituting side walls of the doll's house 1, are connected along their lower edges to the base panels 3 and 4, respectively, by hinge means 9 and 10, respectively, having folding or hinging axes parallel to the axis 6. Two further upstanding rectangular panels 11 and 12, which are disposed between and parallel to the panels 7 and 8 and which constitute internal walls of the doll's house 1, are also connected to the base 2 by hinge means 13 and 14, respectively. The hinge means 13 has a folding or hinging axis substantially co-axial with the axis 6 and the hinge means 14 has a folding or hinging axis parallel to the axis 6. The panels 7 and 8 defining the side walls of the doll's house have substantially the same height. The panel 12 has a greater height than each of the panels 7 and 8, and the panel 11 has a greater height than panel 12.

The doll's house 1 is provided with a roof, generally designated 15, consisting of a pair of rectangular roof panels 16 and 17 connected together by hinging means 18 having a folding or hinging axis 19 parallel to the axis 6. The roof panel 16 (17) is connected to the upper edge of the panel 7 (8) adjacent its edge remote from and parallel to the hinging axis 19 by means of further hinging means 20 (21).

The doll's house 1 is also provided with an upstanding front wall, generally designated 22, consisting of a pair of front panels 23 and 24 connected together by hinging means 25 (see Figure 2) having a folding or hinging axis 26 which is perpendicular to the axis 6 and contained in the same plane as the panel 11. The front panel 23 (24) is connected to the front vertical edge of the panel 7 (8)

along its edge remote from and parallel to the hinging axis 26 by means of further hinging means 27 (28). Locking means, in the form of slots, 29 30 and 31 (see Figure 3) disposed along the axis 26 of the front wall 22, are releasably cooperable with further locking means, in the form of tabs 32, 33 and 34, respectively, on the front vertical edge of the panel 11, to lock the front wall 22 to the panel 11 when the doll's house is in its fully erected state (as shown in Figure 1).

Spaced above the base 2, between each adjacent pair of upstanding panels 7, 11, 12 and 18, there is provided at least one rigid link in the form of floor panels 35 to 38. The floor panel 35 is rectangular, is disposed parallel to the base panel 4 and is connected along a pair of its spaced apart and parallel sides to the panels 8 and 12 by hinge means 39 and 40, respectively. Between adjacent upstanding panels 12 and 11 there is connected the two rectangular floor panels 36 and 37 spaced one above the other parallel to the base panel 4. Each panel 36 (37) is connected along a pair of its spaced apart and parallel sides to the panels 12 and 11 by hinge means 41 (43) and 42 (44), respectively. The floor panel 38 is parallel to the base panel 3 and is of generally rectangular shape but has an opening 45 for a staircase, generally designated 46, removed from one of its corners. The panel 38 is connected along a pair of its spaced apart and parallel sides to the panels 11 and 7 by hinge means 47 and 48, respectively. It will be appreciated that the folding or hinging axes of the hinge means 39, 40, 41, 42, 43, 44, 47 and 48 are disposed parallel to the axis 6.

The staircase 46 consists of an upper and a lower flight of stairs 49 and 50, respectively, made from blanks 51, 52 and 53, 54 (see Figures 4a and 5a) of foldable material, e.g. cardboard. (It should be realised that in the drawings of each blank the solid lines represent cut lines, the dashed lines represent scores on the front surface of the blank to facilitate upwards folding, and the dotted lines represent scores on the back surface of the blank to facilitate downwards folding.) The blanks 51 and 53 constitute steps of the staircase 46 and the blanks 52 and 54 constitute a handrail for the staircase 46. Prior to positioning the staircase 46 in the doll's house 1, part 55 (shown in cross-hatched lines in Figure 4a) of blank 52 is adhered to part 56 (also shown in cross-hatched lines in Figure 4a) of the blank 51 and part 57 (shown in cross-hatched lines in Figure 5a) of blank 54 is adhered to part 58 (also shown in cross-hatched lines in Figure a) of the blank 53. The staircase is then ready to be positioned in the doll's house 1 and this is achieved by adhering parts 59 and 60 (shown in cross-hatched lines in Figure 4a) to the front panel 23 and panel 7, respectively, and part 61 (shown in cross-hatched lines in Figure 5a) to the panel 7. It will of course be readily apparent to those skilled in the art the precise locations that parts 59 to 61 are to be adhered to the panels 23 and 7. Handrails 100, 101 are arranged around the well of the staircase parallel to the panel 11 and are hinged to the floor panel 38. At least one connecting means 103 is hinged to each of the handrails 100, 101 and at least one further connecting rod or panel 104

hingedly connects the handrail 101 to the panel 11.

In order to collapse the doll's house 1 from its erected state (shown in Figure 1), the tabs 32 to 34 are first of all disengaged from the slots 29 to 31, respectively, and the base panels 3 and 4 are then folded upwardly about axis 3 towards a folding plane containing the panel 11. As can be seen from Figures 2 and 3, as the doll's house 1 is collapsed, the connecting panels 103, 104 move the handrails 100, 101 downwardly substantially into the plane of the floor panel 38, the upstanding panels 7, 8 and 12 move towards the panel 11, the floor panels 35 to 37 move towards the base panel 4, the floor panel 38 moves toward the base panel 3, the lower flight of stairs collapses against the front panel 23 (see Figure 4b) and the upper flight of stairs collapses against the panel 7 (see Figure 5b). In addition, as the doll's house is collapsed the hinge means 18 and 25 move away from the panel 11 as the panels 16, 17 and 23, 24, respectively, fold towards each other, the axes 19 and 26 remaining at all times in the said folding plane. It will be appreciated that in the fully collapsed state of the doll's house 1, the panels will be folded flat against each other so as to occupy positions substantially parallel to the folding plane.

In order to re-erect the doll's house 1, the base panels 3, 4 are folded outwardly about the axis 6 until they occupy a substantially planar position. As the panels 3, 4 are folded outwardly away from the folding plane the remaining panels automatically move towards their erected positions. When the doll's house 1 is in its erected state the tabs 32 to 34 are locked in the openings 29 to 31, respectively, to lock the doll's house in its erected state.

The panels may be constructed of any suitable rigid or semi-rigid sheet material, for example cardboard, metal, plastics sheet material, although hardboard is the preferred sheet material. The hinging means have been shown in Figures 1 to 3 as comprising tape. However any hinging means may be employed, in particular a hinge as described in my co-pending Application No. 7928199 (filed on the same date as the present application and entitled "Improvements in hinged assemblies").

Another embodiment of a collapsible and self-erecting doll's house, generally designated by the reference numeral 70, is shown in Figure 6. As will be appreciated by a person skilled in the art the doll's house 70 is similar in many respects to the doll's house 1, and for this reason the doll's house 70 will only be described briefly hereinafter. Furthermore where applicable similar reference numerals have been used to described similar parts of the doll's houses 1 and 70.

In the doll's house 70, the base 2 consists of two differently sized base panels 3 and 4 which are foldable about the hinging axis 6. The upstanding panel 11 is contained in the folding plane of the doll's house 70. The front wall 22 is not connected permanently to the panels 7 and 8 (as is the case in the doll's house 1) but is connected by hinge means 71 to the front edge of the base 2, the hinge means 71 having a folding or hinging axis disposed perpendicular to the axis 6. Furthermore the roof 15 is not connected permanently to the panels 7 and 8 (as

in doll's house 1) but is connected by hinge means 73 to the upper edge of the upstanding panel 11.

The staircase 46 is positioned against the panel 11 and consists of upper and lower flights of stairs. The upper flight of stairs is constructed from blanks 53 and 54 similar to those shown in Figure 5a, however in this instance the part 61 is adhered to the panel 11 (instead of panel 7 in doll's house 1). The lower flight of stairs is constructed from the blanks 74 and 75 shown in Figure 8a, the parts 76 and 77 (shown cross-hatched in Figure 8a) being adhered together prior to adhering the parts 78 and 79 (shown cross-hatched in Figure 8a) to the base panel 3 and front panel 23, respectively. Handrails 100, 101, arranged around the well of the staircase parallel to the panel 11, are hinged to floor panel 102 and are connected together by at least one connecting means 103 hinged to each of the handrails 101 and 102. A rod 104 is hinged at each of its opposite ends to the handrail 100 and the panel 11. The doll's house 70 also includes rails 134, 105, 106 and 107 arranged around a floor panel 108. The rail 106 is hinged to the floor panel 108 and can be locked in its upright position by locking means 109 cooperable with further locking means 110 on the rail 107.

Webs 120 and 121 are connected between the base panel 4 and side wall 8 and between the base panel 3 on an outer upstanding panel 122. Each web 120, 121 is foldable about lines 123, 124, respectively, each web 120, 121, being fully opened out when the doll's house 70 is fully erected to hold the doll's house in its fully erected state, and being folded about line 123, 124 when in the collapsed state.

In order to collapse the doll's house 70, the rail 106 is folded into a position co-planar with the floor panel 108 and the front wall 22 is then folded downwardly into the plane of the base 2 so that the folding or hinging axis of the hinge means 71 is aligned with the axis 6 and the front panels 23 and 24 form forward extensions of the base panels 3 and 4, respectively. This downward folding of the front wall 22 causes the lower flight of stairs (as shown in Figure 8b) to be folded flat against the base panel 3 and front panel 23. The panels 3, 23 and 4, 24 are then folded upwardly about the hinging axis and the upstanding panels and floor panels are folded towards the panel 11 in a similar manner to that described in respect of the doll's house 1. During the collapsing of the doll's house 70, the upper flight of stairs of the staircase is caused to be folded flat against the panel 11, and the rod 104 pushes the handrails 100 and 101 flat against the floor panel 102. The roof panels 16 and 17 may be folded together upwardly (as shown in Figure 7) or allowed to overlap the outermost upstanding panels, when the doll's house 70 has been fully collapsed. The doll's house 70 is re-erected by unfolding the panels 3, 23 and 4, 24 and subsequently folding upwardly both the front wall 22 about the hinging axis of the hinge means 71 and the rail 106 relative to the floor panel 106. The front wall 22 is provided with a plurality of locking means 80, in the form of slots, openings or tabs, which are cooperable with further means 81, also in the form of cooperating slots,

openings or tabs, provided on the upstanding walls and/or roof 15 to lock the doll's house in its erected state.

A third embodiment of a collapsible and self re-erecting doll's house, generally designated 85, is shown in Figure 9. Similar parts in the doll's house 1 and 85 have been given the same reference numerals.

The main features of difference in the doll's house 85 relate to the provision of staircase 46 having a single flight of stairs, the design of the doll's house so as to have no upstanding panel contained in the main folding plane, and the provision of a detachable roof 15.

Looking at each of these main features in turn, blanks 86 and 87 (see Figure 11) are used for forming the steps and handrail, respectively, of the single flight staircase 46. In particular the parts 88 and 89 (shown cross-hatched in Figure 11) on the blanks 86 and 87, respectively, are adhered together prior to adhering parts 90 and 91 (shown cross-hatched in Figure 11) to the front panel 23 and upstanding panel 92, respectively.

Since there is no upstanding panel contained in the folding plane it is essential to provide two floor panels 93 and 94 between adjacent upstanding panels 95 and 96 which are disposed on opposite sides of the folding plane. The floor panels 93 and 94 are hingedly connected together with the folding or hinging axis 97 being contained in the folding plane. In a similar manner rail 98 is hinged with its hinging axis 99 being contained in the folding plane. It should also be realised that the folding axis 16 of the front wall 22 is arranged to lie in the folding plane.

The roof 15, consisting of the hinged roof panels 16 and 17, has a clip 130 secured to its underside which can be clipped to one of the upstanding panels 111. The roof panel 16 is also provided with an opening 112 through which a tab 113 on the front wall 22 is passed to define a chimney of the doll's house 85.

It should be realised that the hinge means employed in the doll's house 85 are each of the type disclosed in my aforementioned co-pending Application No. 7928199 of even date and entitled "Improvements in hinged assemblies".

In each of the embodiments of doll's house described the upstanding panels may be provided with openings defining windows or doors.

In other embodiments of building structure according to the invention some of the floor panels may be replaced by rods (e.g. if it is desirable not to separate adjacent upstanding panels into separate vertical chambers). Instead of comprising a doll's house the building structure could comprise another type of building, e.g. a model fort.

CLAIMS

1. A collapsible and self-erecting model building structure comprises a base consisting of first and second base panels which are hingedly connected together about a first hinging axis and which occupy an open position in which the base panels lie in a common plane on opposite sides of the first hinging

axis, the first and second base panels being foldable towards each other about said first hinging axis into a closed position in which the base panels are disposed above, and at least substantially in a folding plane perpendicular to, said common plane, at least three spaced apart, parallel upstanding panels hingedly connected to the base about hinging axes parallel to the said first hinging axis, two of said upstanding panels, disposed on opposite sides of said folding plane, constituting side walls of the model building structure, at least one first rigid linking means spaced above, and disposed on the same side of said folding plane as, in parallel relationship to, said first base panel, at least one second rigid linking means spaced above, and disposed on the same side of said folding plane as, in parallel relationship to, said second base panel, the rigid linking means, at least one of which is a floor panel, being arranged so that each pair of adjacent upstanding panels is connected by at least one link, each link being hingedly connected at its opposite ends to adjacent upstanding panels about hinging axes parallel to said first hinging axis and consisting of either a pair of rigid linking means hingedly connected together about a second hinging axis which is parallel to said first hinging axis and is contained in said folding plane or a single rigid linking means; whereby on folding the base panels from their open position to their closed position, the upstanding panels are moved towards, whilst remaining substantially parallel to, the folding plane, the first rigid linking means are moved towards, whilst remaining substantially parallel to, the first base panel and the second rigid linking means are moved towards, whilst remaining substantially parallel to, the second base panel, thereby causing the model building structure to collapse, and whereby on folding the base panels from their open position to their closed position, the upstanding panels, first rigid linking means and second rigid linking means are moved away from, whilst remaining substantially parallel to, the said folding plane, the first base panel and the second base panel, respectively, thereby causing the model building structure to be erected.

2. A model building structure according to claim 1, in which each of said first and second rigid linking means consists of a floor panel.

3. A model building structure according to claim 1 or 2, in which each of the said panels is made of a semi-rigid and substantially non-extensible material.

4. A model building structure according to any of the preceding claims, comprising an upstanding front wall.

5. A model building structure according to claim 4, in which the front wall consists of two front panels which are hingedly connected together about a third hinging axis contained in the said folding plane and perpendicular to the first and second folding axes.

6. A model building structure according to claim 5, in which the front wall, along side edges on opposite sides of and parallel to said third hinging axis, is hingedly connected to each of the upstanding panels constituting said side walls about hinging axes parallel to said third hinging axis, the front wall

being adapted to fold about said third folding axis as the latter moves within the folding plane during folding of the said first and second base panels between their open and closed positions.

- 5 7. A model building structure according to claim 5, in which the front wall is hingedly connected to said base about a fourth hinging axis perpendicular to said folding plane; the said front wall being foldable about said fourth hinging axis into the said
10 common plane, so that said third hinging axis is coaxial with said first hinging axis, to enable the model building structure to be collapsed on subsequent folding of the first and second base panels from their open position to their closed position.
- 15 8. A model building structure according to claim 7, comprising at least one foldable web connected between the base and at least one of the upstanding panels, the or each web being in a folded, inoperative condition when the model building structure is
20 not fully erected, but being in a folded and taut operative condition when the model building structure is fully erected to hold upstanding panels in their erected states.
9. A model building structure according to any of
25 claims 4 to 8, in which the front wall is provided with first locking means cooperable with second locking means on one or more of the upstanding panels and/or the base to lock the front wall in its upstanding, erect position.
- 30 10. A model building structure according to any of the preceding claims, in which the, or one of the, said floor panel(s) is provided with a staircase opening for a staircase which extends from the base to the staircase opening.
- 35 11. A model building structure according to claim 10, in which the staircase consists of a single flight of stairs hingedly connected to the front wall or one of said flight of stairs to be folded flat against said front wall or upstanding panel when the model
40 building structure is fully collapsed and to be in an erected state when the model building structure is fully erected.
12. A model building structure according to claim 10, in which the staircase consists of a first and
45 a second flight of stairs, one of the flights of stairs being hingedly connected to the front wall and the other flight of stairs being hingedly connected to one of said upstanding panels, each flight of stairs being foled flat when the model building structure is fully
50 collapsed and being in an erected state when the model building structure is fully erected.
13. A model building structure according to any of claims 10 to 12, in which the, or the said one, floor panel has at least one collapsible and self-erecting
55 rail hingedly connected thereto around at least part of the staircase opening.
14. A model building structure according to any of the preceding claims, provided with a roof.
15. A model building structure according to
60 claim 14, in which the roof consists of two roof panels which are hingedly connected together about a fifth hinging axis contained in said folding plane and parallel to said first and second hinging axes.
16. A model building structure according to
65 claim 15, in which the roof, along or adjacent side

edges on opposite sides of and parallel to said fifth hinging axis, is hingedly connected to each of the upstanding panels constituting said side walls about hinging axes parallel to said first and second hinging axes, the roof being adapted to fold about said fifth folding axis as the latter moves within the folding plane during folding of said first and second base panels between their open and closed positions.

17. A model building structure according to
75 claim 14 or 15, in which the roof is detachably connected to one or more of the upstanding panels.

18. A collapsible and self-erecting model building structure constructed and arranged substantially as herein described with reference to, and as
80 illustrated in, Figures 1 to 3, 4a, 4b, 5a, and 5b, Figures 6, 7, 8a and 8b, or Figures 9 to 11.

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